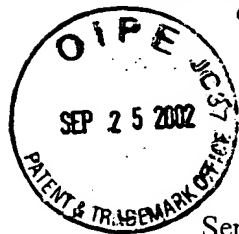




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TAWASSUL A. KHAN
C.E.O.



SENT VIA FACSIMILE 703/872-9318

September 18, 2002

Toan M. Le, Examiner
Box PATENT APPLICATION
Commissioner for Patents
Washington, DC 20231

RECEIVED
SEP 27 2002
TECHNOLOGY CENTER 2800

RE: Application No. 09/853,190
Applicant Tawassul A. Khan (Inventor)
Titled - Mapping Permeable Reservoir Formations by Measuring the
Elastic Nonlinear Interactions of a Seismic Wave as it Propagates
through the Reservoir Rock Matrix and its Pore Fluids.

Dear Mr. Le:

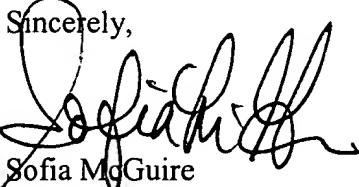
Enclosed is the Reply to USPTO Office Action Summary of July 31, 2002 regarding Application No. 09/853,190.

The write-up has been submitted for the intent of making the patent clearer and the claims have been rewritten and modified to be more specific and to remove any ambiguity of these claims by taking out any 'general' terms. Please reconsider the revised claims; we believe we have reduced any uncertainty due to the generic nature of our previously written claims.

Further, we are resubmitting and rewriting the original claim 9 for consideration. This election to resubmit all 9 claims supersedes the provisional election made by Sofia McGuire on July 23, 2002.

Thank you for your consideration in this matter. Please do not hesitate to contact me at 713/942-7926 with any questions.

Sincerely,


Sofia McGuire



**REPLY TO USPTO OFFICE ACTION SUMMARY OF JULY 31, 2002,
RE: APPLICATION NO. 09/853,190**

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Election/Restrictions

The applicant resubmits the original claim 9 for consideration as a species of the claim that is being submitted. The original claims 1-9 are clarified as follows in italics:

A new method for determining in-situ bulk tortuosity of the interconnected pores of reservoir rock, and estimating the bulk permeability of a reservoir formation between seismic transmitters and seismic receivers, such method comprising 1-7 below:

1. *Transmit a monofrequency signal generated by a seismic transmitter or seismic transmitters and received by a seismic receiver or seismic receivers.*
2. *Analyze the spectral content of the received signal.*
3. *Identify the side lobes of the monofrequency signal that was transmitted.*
4. *The frequency of the side lobes represents $(F - F_{drag})$ and $(F + F_{drag})$ where F is the monofrequency and F_{drag} is the frequency of the 'Drag Wave'. These side lobes are generated due to the elastic nonlinear interaction between the monofrequency wave traveling through the rock matrix and the 'Drag Wave' being generated due to the coupling between the matrix and pore fluids.*
5. *Calculate the velocity of the 'Drag Wave' V_{drag} by using the Doppler Effect in which $F_{drag}/F = V_{drag}/(V - V_{drag})$; where F_{drag} is the frequency of the 'Drag Wave' (see 4 above), F is the monofrequency, V_{drag} is the velocity of the 'Drag Wave' and V is the velocity of the monofrequency signal.*
6. *The bulk tortuosity of the inter-well reservoir rock formation can be estimated by: $V_{drag} = V_{fluid}/\sqrt{T}$, where V_{drag} is the velocity of the 'Drag Wave', T is tortuosity, and V_{fluid} is the compressional velocity of the pore fluids.*
7. *Once bulk tortuosity has been estimated, bulk permeability can be estimated using Scheidegger's equation $K = \phi r^2 / 8T$ or other equations generated by Kelder or Peeters.*
8. *The method of claims 1-7 specifically used to determine in-situ bulk tortuosity of the interconnected pores of reservoir rock, and estimating the bulk permeability of a reservoir formation connected between two wells.*
9. *The method of claims 1-7 specifically used to determine in-situ bulk tortuosity of the interconnected pores of reservoir rock, and estimating the bulk permeability of a reservoir formation in a well between two depth points in that well.*



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Approved for use through 10/31/2002. OMB 0651-0031
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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number **09/853,190**

Filing Date **5-11-01**

First Named Inventor **Tawassut A. Khaf**

Group Art Unit **2862**

Examiner Name **Toan M. Le**

Total Number of Pages in This Submission **13**

Attorney Docket Number

ENCLOSURES (check all that apply)

☐ Fee Transmittal Form

☐ Fee Attached

☒ Amendment / Reply

☐ After Final

☐ Affidavits/declaration(s)

☐ Extension of Time Request

☐ Express Abandonment Request

☐ Information Disclosure Statement

☐ Certified Copy of Priority Document(s)

☐ Response to Missing Parts/
Incomplete Application

☐ Response to Missing Parts
under 37 CFR 1.52 or 1.53

☐ Assignment Papers
(for an Application)

☐ Drawing(s)

☐ Licensing-related Papers

☐ Petition

☐ Petition to Convert to a
Provisional Application

☐ Power of Attorney, Revocation
Change of Correspondence
Address

☐ Terminal Disclaimer

☐ Request for Refund

☐ CD, Number of CD(s) _____

☐ After Allowance Communication
to Group

☐ Appeal Communication to Board
of Appeals and Interferences

☐ Appeal Communication to Group
(Appeal Notice, Brief, Reply Brief)

☐ Proprietary Information

☐ Status Letter

☒ Other Enclosure(s) (please
identify below):

**Revised Claims
Response to Office
Action Summary**

Remarks

Please read enclosed letter.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm
or
Individual name

**Sofia McGuire, Vice President, Nonlinear Seismic
Imaging, Inc.**

Signature

Sofia McGuire

Date

9-20-02

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231 on this date: **9-20-02**

Typed or printed name

Sofia K. McGuire

Signature

Sofia McGuire

Date

9-20-02

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